

Performance evaluation of finite-source cognitive radio networks with impatient customers

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The present paper deals with a retrial queuing system with two finite-number of sources that model a cognitive radio network. We consider two different types of customers (Primary and Secondary ones) assigned to two not independent, interconnected frequency bands. The first frequency band with a priority queue (FIFO) and the second service unit with an orbit, that are dedicated for Primary Users (PUs) and Secondary Users (SUs), respectively. A generated licensed request is sent to the Primary Service Unit. If the unit is free, the service starts right away. If this frequency band is busy with a high priority job, the new generated packet is redirected to the FIFO queue. However, if the unit is occupied with a request from unlicensed user, its service is stopped and the low priority task is sent to the Secondary Service Unit. Based on the status of the server the interrupted job joins either the server or the orbit. In case a job from SUs finds Secondary Channel Service (SCS) idle, the service begins. If the SCS is full, the new request attempts to access the Primary Channel Service (PCS). Supposing the PCS is idle, the low-priority packet might opportunistically join the high-priority channel PCS to get served. However, if the PCS is busy, the last packet is sent to the orbit. From the orbit the postponed request retries to get served after a random time.

The novelty of this work is the introduction of the abandonment of Secondary Users from the orbit. Therefore, Secondary Users (impatient customers) leave the system if their total waiting time exceeds a given maximum waiting time. By use of simulation we investigate the impact of the abandonment on several performance measures of the system such as the mean response time and waiting time of the users, probability of abandonment of SU, utilization of servers, etc. Several figures illustrate the problem in question.

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